Curve interpolation model for visualising disjointed neural elements

Abstract

Neuron cell are built from a myriad of axon and dendrite structures. It transmits electrochemical signals between the brain and the nervous system. Three-dimensional visualization of neuron structure could help to facilitate deeper understanding of neuron and its models. An accurate neuron model could aid understanding of brain's functionalities, diagnosis and knowledge of entire nervous system. Existing neuron models have been found to be defective in the aspect of realism. Whereas in the actual biological neuron, there is continuous growth as the soma extending to the axon and the dendrite; but, the current neuron visualization models present it as disjointed segments that has greatly mediated effective realism. In this research, a new reconstruction model comprising of the Bounding Cylinder, Curve Interpolation and Gouraud Shading is proposed to visualize neuron model in order to improve realism. The reconstructed model is used to design algorithms for generating neuron branching from neuron SWC data. The Bounding Cylinder and Curve Interpolation methods are used to improve the connected segments of the neuron model using a series of cascaded cylinders along the neuron's connection path. Three control points are proposed between two adjacent neuron segments. Finally, the model is rendered with Gouraud Shading for smoothening of the model surface. This produce a near-perfection model of the natural neurons with attended realism. The model is validated by a group of bioinformatics analysts' responses to a predefined survey. The result shows about 82% acceptance and satisfaction rate.